جامعة جدة

University of Jeddah

CHAPTER 5

Know the risks of the chemical reagents you are working with

WORKER EDUCATION

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

- All persons who work with controlled products must be provided with WHMIS worker education.
- WHMIS Worker Education includes four (4) areas of instruction:
- WHMIS Labels and MSDSs
- Hazard Information
- Identification Codes
- Procedures for safe use, storage and handling and disposal of controlled products.

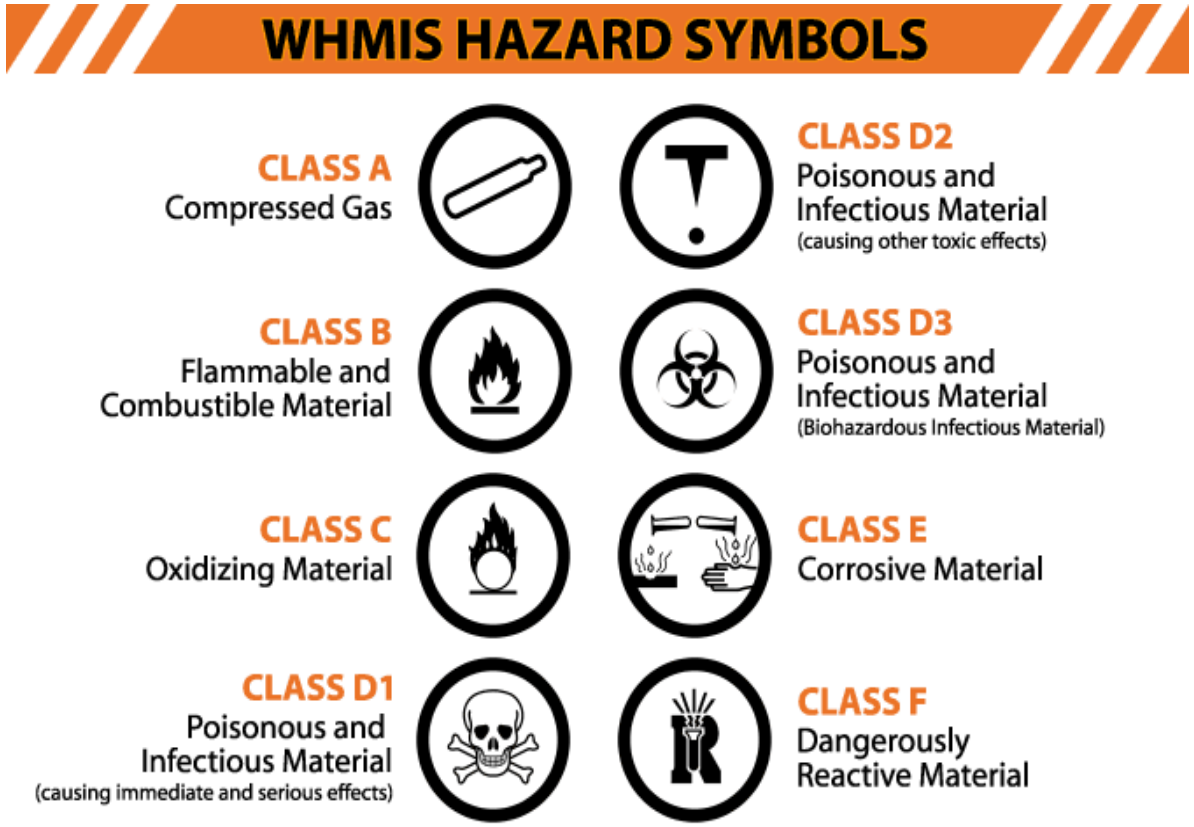
WHAT IS WHMIS?

- WHMIS was designed to address employers' and workers' right to know about the hazards and safe work practices related to certain chemicals and infectious biological substances. Materials that are subject to WHMIS legislation is called controlled products
- Requires employees to use products safely
- Requires the employer to ensure that employees are trained to use products safely and have access to information on safe use

KEY ELEMENTS TO WHMIS

- Identification : Labeling/Hazard Symbols
- Knowledge: Worker Education & Training
- Information: Material Safety Data Sheets

التعريف: رموز الخطر
المعرفة: تعليم وتدريب العمال
المعلومات: صحائف بيانات سلامة المواد



- WHMIS covers six classes of controlled products, which are divided into eight symbols. This classification is the foundation of WHMIS.

HAZARDS SYMBOLS
CLASS A: COMPRESSED GAS

Characteristics

- Gas inside cylinder is under pressure

Hazards

- Cylinder may explode if dropped or heated
- Hazards associated with force of explosion and contents of cylinder

Handling and Use

- Transport with specialized cart
- Use gas specific regulator
- Store away from heat and fire sources
- Test connections for leaks
- Ensure cylinders are properly secured

Example

Acetylene and oxygen are examples of compressed gases.

CLASS B: FLAMMABLE AND COMBUSTIBLE

- Characteristics
  - May burn or explode when exposed to heat, sparks, or flames
- Hazards
  - May ignite spontaneously
  - May ignite upon decomposing or being exposed to water
- Handling and Use
  - Store away from Class C: Oxidizing Materials
  - Avoid storing near sources of heat, sparks, or flames
  - Keep containers tightly sealed
  - Ground and bond when dispensing from 25 L containers
  - Store in flammable cabinets if quantities exceed 50 L
  - Transport using secondary containment

Examples

Methane, acetone, aniline, and lithium hydride
of flammable materials.

CLASS C: OXIDIZING MATERIAL

- Characteristics
  - Can promote burning or explosions of other materials by providing an oxygen source for combustion
- Hazards
  - May burn skin and eyes on contact
  - Increase fire and explosion hazard
  - May cause combustibles to explode or react violently
- Handling and Use
  - Transport and store separately from flammables and organics
  - Store in non-corroding containers
  - Store away from sources of heat and ignition
  - Wear proper personal protective equipment
- **Examples**
  - **Hydrogen peroxide, Ozone, chlorine, and nitrogen dioxide are oxidizing materials.**
  - **Bleach**
  - **Nitrates**

CLASS D: POISONOUS AND INFECTIOUS MATERIALS

Division 1: Materials causing immediate and serious toxic effects (acute)

Subdivision A: Very toxic material
Subdivision B: Toxic material

Characteristics

Poisonous and potentially fatal materials resulting in immediate and severe harm

Hazards

Small quantities may be harmful or lethal
May cause immediate death or serious harm if inhaled, swallowed, or absorbed through the skin

Handling and Use

Avoid skin and eye contact
Minimize vapor exposure
Wear the recommended personal protective equipment
Wash hands after handling

Examples

Cyanides, styrene
All halogens

Division 2: Materials causing other toxic effects (chronic, delayed)

Subdivision A: Very toxic material
Subdivision B: Toxic material

Characteristics

Materials which have harmful effects after repeated exposures over long periods of time

Hazards

May cause death or permanent injury
May cause organ damage, cancer, birth defects, or sterility
May lead to sensitization or allergies

Handling and Use

Avoid skin and eye contact
Minimize vapor exposure
Wear the recommended personal protective equipment
Wash hands after handling

Examples

Asbestos causes cancer, ammonia is an irritant. Benzene

CLASS D: POISONOUS AND INFECTIOUS MATERIALS

Division 3: Biohazardous infectious material

Characteristics

Infectious agents or biological toxins resulting in serious disease or death

Hazards

May cause serious disease resulting in illness or death

Handling and Use

Work with materials in designated area (ie. Biosafety cabinet)
Disinfect area after cleaning
Wash hands after handling
Wear proper personal protective equipment

Examples

E. Coli
Tissues
Viruses
Blood sample containing the Hepatitis B virus is a biohazard infectious material.

CLASS E: CORROSIVE MATERIAL

Characteristics
Materials that will erode metals or destroy tissues

Hazards
Will burn human tissue upon contact
Can corrode laboratory materials, in particular metals

Handling and Use
Store acids and bases separately
Store chemicals in non-corroding containers
When possible, work in a fume hood
Wear recommended personal protective equipment

Examples
Strong acids and bases
Hydrogen Fluoride

CLASS F: DANGEROUS REACTIVE MATERIALS

Characteristics
Materials may undergo unexpected reactions under certain conditions

Hazards
May be chemically unstable
May vigorously polymerize
May react with water to release a toxic or flammable gas
May explode if exposed to heat or shock
May burn unexpectedly

Handling and Use
Follow MSDS recommendations for storage and use
Wear recommended personal protective equipment
Examine storage containers frequently
Store and transport securely

Examples
Azides, Hydrazine, Ether
Ozone, hydrazine, and benzoyl peroxide are examples of dangerously reactive materials.

EXEMPTIONS FROM WHMIS LEGISLATION

The following products are excluded from all aspects of WHMIS legislation:

- Wood and products made of wood
- Tobacco and products made of tobacco
- Manufactured articles
- Dangerous materials while they are covered by TDG legislation (while in transit)
- Hazardous wastes (except that safe storage and handling are required)

The following list of products are excluded from the supplier aspects of WHMIS:

- Explosives
- Cosmetics, devices, foods and drugs
- Pesticides and herbicides
- Radioactive materials
- Consumer products

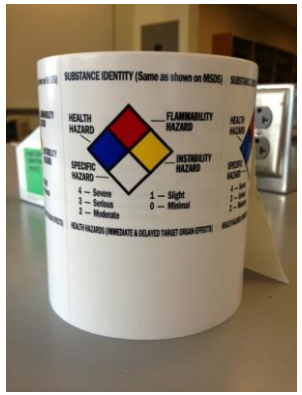
WHMIS Chemical Hazards Pictograms 2015

WHMIS 1988 Hazard Class	WHMIS 1988 Symbols	WHMIS 2015 Symbols	WHMIS 2015 Hazard Class
A			Gases Under Pressure
B1 to B6			Flammables, Self-Heating, Emit Flammable Gases, Pyrophoric Gases, Liquids & Solids Organic Peroxides
C			Oxidizing Gases, Liquids, Solids
D1			Acute Toxicity - Oral, Dermal, Inhalation
D2			Eye Irritation, Skin Irritation Skin/Respiratory Sensitization, Carcinogenicity Mutagenicity Reproductive Hazards
D3			Biohazardous Infectious Materials
E			Skin/Eye Corrosion Corrosive to Metals
F			Self-Reactive Substances Organic Peroxides
N/A	N/A		Explosive Substances (Explosives are still covered under WHMIS exclusions for now)
N/A	N/A		Aspiration, STOT (Single Exposure, Repeated Exposure)
N/A	N/A	N/A	Combustible Dusts
N/A	N/A	N/A	Simple Asphyxiants
N/A	N/A	Use appropriate symbol	Physical Hazards Not Otherwise Classified, Health Hazards Not Otherwise Classified

Meaning of shape and color of Hazard Symbols

LABELS ARE IMPORTANT

National Fire Protection Association (NFPA)
Globally Harmonized System (GHS)

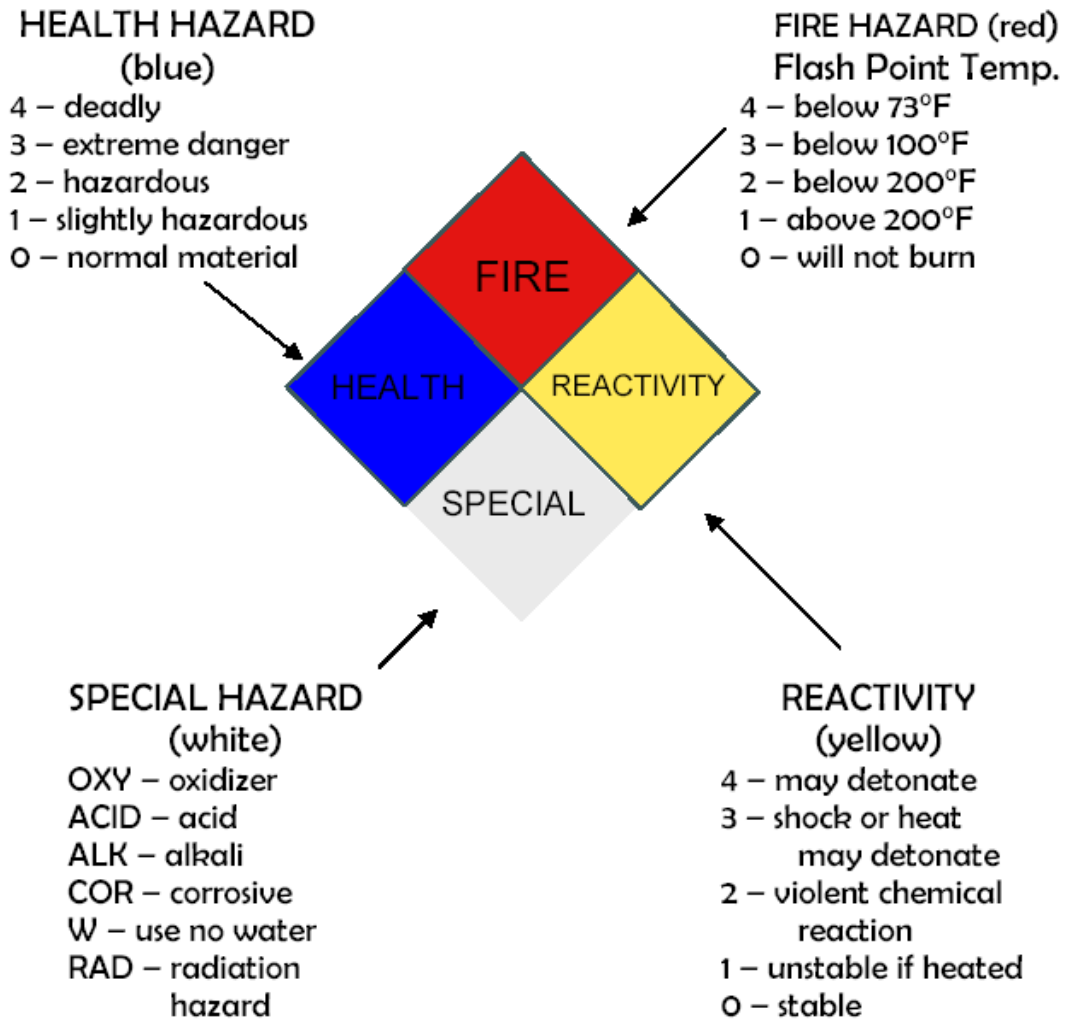


Older NFPA labels with hazard levels identified on the diamond

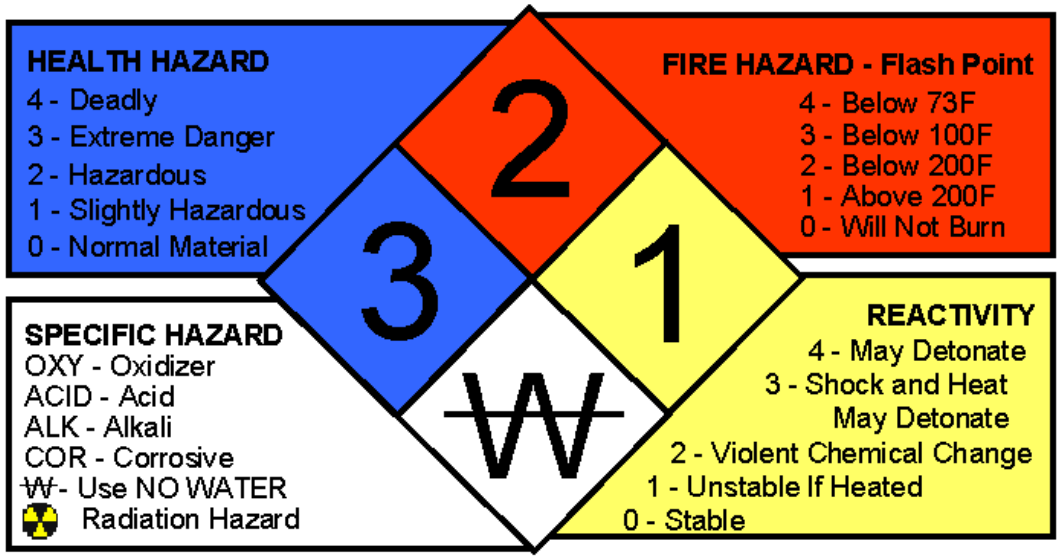
New GHS label system with pictogram hazards

Even if it seems obvious.
In the chemistry lab, nothing is ever obvious.

- Chemicals from suppliers must be labelled
- Do not remove or deface mfg. labels
- Secondary containers must be labelled with chemical name and hazard warning
- May use: NFPA or GHS label
- Students may want to bring a sharpie to lab for writing labels on solutions that they make. At a minimum, a student made solution should have the chemical name, the date, and the student's initials.

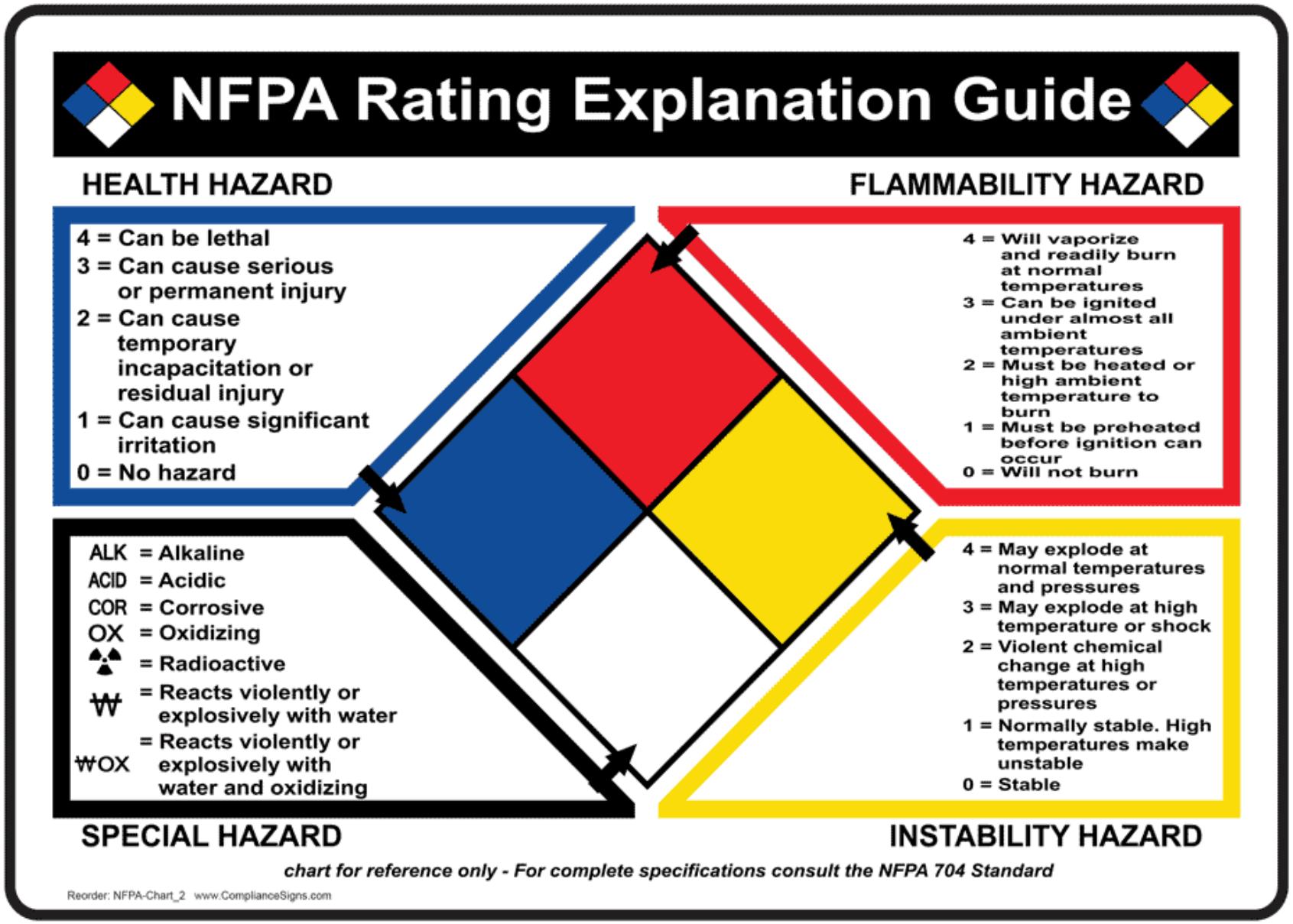


NATIONAL FIRE PROTECTION ASSOCIATION (N F P A)



Special Hazard Rating "OX"

- **Materials are oxidizing agents**. These compounds give up oxygen readily, remove hydrogen easily, remove hydrogen from other compounds, or attract electrons


NFPA Rating Explanation Guide
HEALTH HAZARD
4 = Can be lethal
3 = Can cause serious or permanent injury
2 = Can cause temporary incapacitation or residual injury
1 = Can cause significant irritation
0 = No hazard
FLAMMABILITY HAZARD
4 = Will vaporize and readily burn at normal temperatures
3 = Can be ignited under almost all ambient temperatures
2 = Must be heated or high ambient temperature to burn
1 = Must be preheated before ignition can occur
0 = Will not burn
ALK = Alkaline
ACID = Acidic
COR = Corrosive
OX = Oxidizing
= Radioactive
= Reacts violently or explosively with water
= Reacts violently or explosively with water and oxidizing
SPECIAL HAZARD
4 = May explode at normal temperatures and pressures
3 = May explode at high temperature or shock
2 = Violent chemical change at high temperatures or pressures
1 = Normally stable. High temperatures make unstable
0 = Stable
INSTABILITY HAZARD
chart for reference only - For complete specifications consult the NFPA 704 Standard
Reorder: NFPA-Chart_2 www.ComplianceSigns.com

NEW STANDARD: GHS (GLOBALLY HARMONIZED SYSTEM)

- Under GHS regulations, each chemical product label must contain the following: Product Identifier, Signal Word, Pictogram, Hazard Statement, and Supplier Information.

Product Identifier 1
Signal Word (Danger or Warning) 2
Hazard Statement(s) 3
Precautionary Statement(s) 4
5
6 Pictogram(s)
ISOBUTYL ALCOHOL
CAS Number: 78-83-1
DOT Number: UN 112
DANGER
Highly flammable liquid and vapor. Causes serious eye damage. May cause drowsiness and dizziness.
Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing fumes/mist/vapors/spray. Wear protective gloves/ protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.
Fill Weight: 123.45 lbs.
Gross Weight: 145.60 lbs.
Fill Date: 10/9/2013
Lot No.: 6305051700
See SDS for further information
IMPRINT ENTERPRISES SINCE 1975
555 N. Commons Dr. * Aurora, IL. 60504 * 800.433.4512 * www.imprint-e.com

- Hazard Statement(s)
  Standardized and assigned phrases that describe the hazard(s) as determined by hazard Classification.
- Precautionary Statement(s)
  Supplements the hazard information by briefly providing measures to be taken to minimize or prevent adverse effects from physical, health or environmental hazards. First aid is included in precautionary information.

WHAT IS A MATERIAL SAFETY DATA SHEET (MSDS)? صحيفة بيانات سلامة المواد :

- MSDS is an acronym for: Material Safety Data Sheet, and should be available in the lab where chemical is used
- Federal Law requires chemical suppliers to provide MSDS to users
- Divided into 16 sections containing 4 types of information
- MSDS used to assess the physical and health hazards of the chemical or product.
- The Laboratory Standard requires laboratories to keep Material Safety Data Sheet manufacturer.
- Material Safety Data Sheet must be obtained at the time of purchase
- A MSDS must be less than 3 years old
- MSDS's must be available for use and reference at all times
- MSDS provides information on:

Health effects of overexposure

Health evaluation related to product handling, storage and use

Measures to protect workers at risk of overexposure

Emergency procedures

- The MSDS must contain the following sections and information:
- Section 1: Product identification and use
- Section 2: Hazardous ingredients
- Section 3: Physical data
- Section 4: Fire and explosive data
- Section 5: Reactivity data
- Section 6: Toxicology properties
- Section 7: Preventative measure
- Section 8: First Aid measures
- Section 9: Preparation date

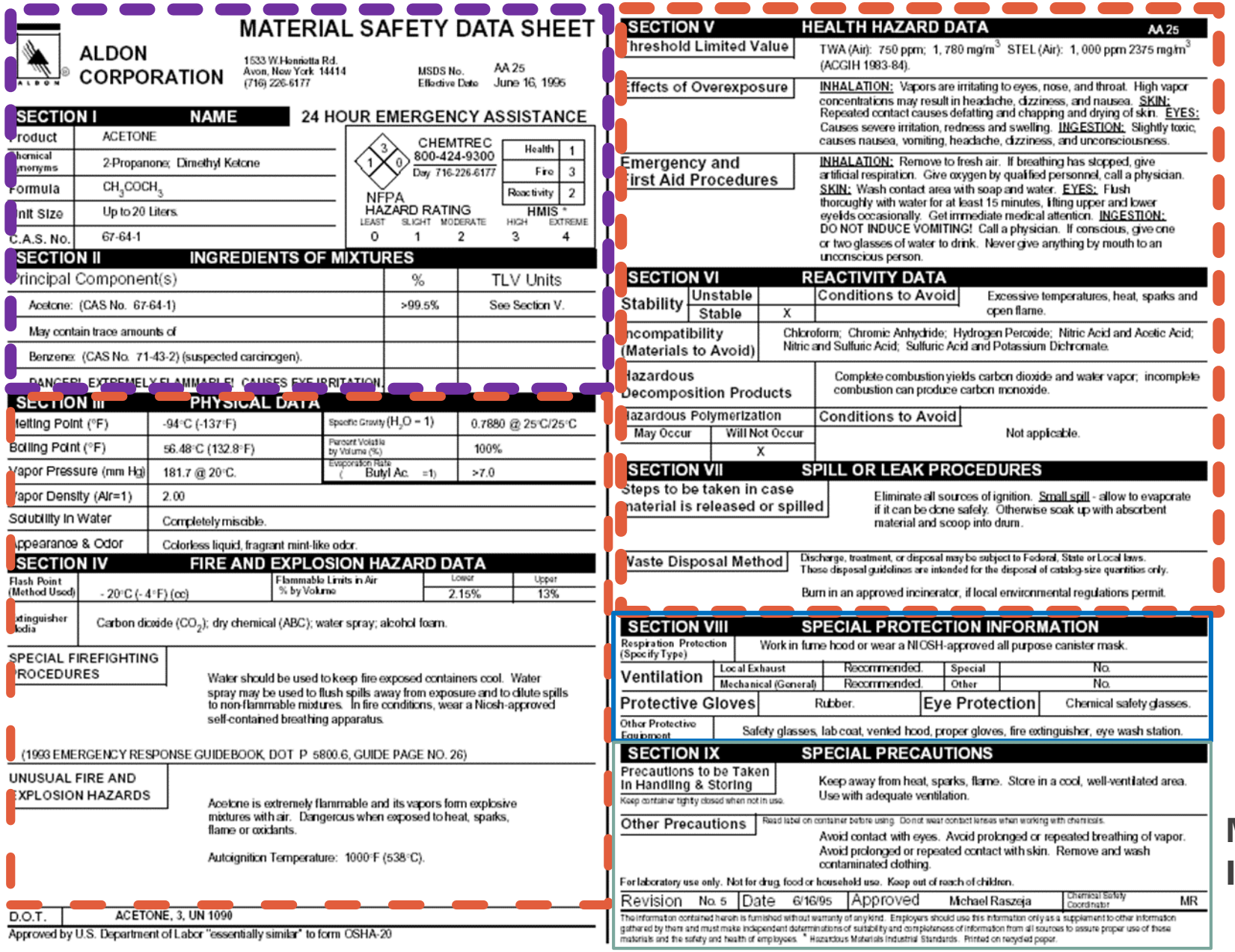
M S D S INFORMATION'S

❑ Critical emergency information: Substance identity, manufacturer, hazardous components and identification
❑ Emergency response measures: First aid, fire-fighting and accidental release
❑ Personal protection and exposure measures , Handling and storage, PPE, exposure controls
Physical and chemical properties
❑ Miscellaneous information: Toxicological and ecological effects, Disposal, transport and regulatory info

EXAMPLE 1

CRITICAL EMERGENCY INFORMATION

EMERGENCY RESPONSE MEASURES



MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
1533 W. Henrietta Rd.
Avon, New York 14414
(716) 226-6177

MSDS No. AA 25
Effective Date June 16, 1995

SECTION I NAME

24 HOUR EMERGENCY ASSISTANCE
CHEMTREC 800-424-9300
Day 716-226-6177

Product	ACETONE
Chemical Synonyms	2-Propanone; Dimethyl Ketone
Formula	CH_3COCH_3
Unit Size	Up to 20 Liters
C.A.S. No.	67-64-1

NFPA HAZARD RATING (LEAST 0 SLIGHT 1 MODERATE 2 HIGH 3 EXTREME 4)

HMIS *

Health	1
Fire	3
Reactivity	2

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Acetone: (CAS No. 67-64-1)	>99.5%	See Section V.
May contain trace amounts of		
Benzene: (CAS No. 71-43-2) (suspected carcinogen).		

DANGER! EXTREMELY FLAMMABLE! CAUSES EYE IRRITATION.

SECTION III PHYSICAL DATA

Melting Point (°F)	-94°C (-137°F)	Specific Gravity (H_2O = 1)	0.7880 @ 25°C/25°C
Boiling Point (°F)	56.48°C (132.8°F)	Percent Volatile by Volume (%)	100%
Vapor Pressure (mm Hg)	181.7 @ 20°C.	Evaporation Rate (Butyl Ac. =1)	>7.0
Vapor Density (Air=1)	2.00		
Solubility in Water	Completely miscible.		
Appearance & Odor	Colorless liquid, fragrant mint-like odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	- 20°C (- 4°F) (cc)	Flammable Limits in Air % by Volume	Lower 2.15%	Upper 13%
Extinguisher Media	Carbon dioxide (CO_2); dry chemical (ABC); water spray; alcohol foam.			

SPECIAL FIREFIGHTING PROCEDURES

Water should be used to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure and to dilute spills to non-flammable mixtures. In fire conditions, wear a Nicosh-approved self-contained breathing apparatus.

(1993 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.6, GUIDE PAGE NO. 26)

UNUSUAL FIRE AND EXPLOSION HAZARDS

Acetone is extremely flammable and its vapors form explosive mixtures with air. Dangerous when exposed to heat, sparks, flame or oxidants.

Autoignition Temperature: 1000°F (538°C).

D.O.T. ACETONE, 3, UN 1090

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA AA 25

Threshold Limited Value	TWA (Air): 750 ppm; 1,780 mg/m^3 STEL (Air): 1,000 ppm 2375 mg/m^3 (ACGIH 1983-84).
Effects of Overexposure	INHALATION: Vapors are irritating to eyes, nose, and throat. High vapor concentrations may result in headache, dizziness, and nausea. SKIN: Repeated contact causes defatting and chapping and drying of skin. EYES: Causes severe irritation, redness and swelling. INGESTION: Slightly toxic, causes nausea, vomiting, headache, dizziness, and unconsciousness.
Emergency and First Aid Procedures	INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. Give oxygen by qualified personnel, call a physician. SKIN: Wash contact area with soap and water. EYES: Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. INGESTION: DO NOT INDUCE VOMITING! Call a physician. If conscious, give one or two glasses of water to drink. Never give anything by mouth to an unconscious person.

SECTION VI REACTIVITY DATA

Stability	Unstable		Conditions to Avoid	Excessive temperatures, heat, sparks and open flame.
	Stable	X		
Incompatibility (Materials to Avoid)	Chloroform; Chromic Anhydride; Hydrogen Peroxide; Nitric Acid and Acetic Acid; Nitric and Sulfuric Acid; Sulfuric Acid and Potassium Dichromate.			
Hazardous Decomposition Products	Complete combustion yields carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.			
Hazardous Polymerization	May Occur	Will Not Occur	Conditions to Avoid	Not applicable.
		X		

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled	Eliminate all sources of ignition. Small spill - allow to evaporate if it can be done safely. Otherwise soak up with absorbent material and scoop into drum.
Waste Disposal Method	Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only. Burn in an approved incinerator, if local environmental regulations permit.

EMERGENCY RESPONSE MEASURES

PERSONAL PROTECTION MEASURE

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type)	Work in fume hood or wear a NIOSH-approved all purpose canister mask.			
Ventilation	Local Exhaust	Recommended.	Special	No.
	Mechanical (General)	Recommended.	Other	No.
Protective Gloves	Rubber.	Eye Protection	Chemical safety glasses.	
Other Protective Equipment	Safety glasses, lab coat, vented hood, proper gloves, fire extinguisher, eye wash station.			

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing (Keep container tightly closed when not in use.)	Keep away from heat, sparks, flame. Store in a cool, well-ventilated area. Use with adequate ventilation.
Other Precautions (Read label on container before using. Do not wear contact lenses when working with chemicals.)	Avoid contact with eyes. Avoid prolonged or repeated breathing of vapor. Avoid prolonged or repeated contact with skin. Remove and wash contaminated clothing.

For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Revision	No. 5	Date	6/16/95	Approved	Michael Raszeja	Chemical Safety Coordinator	MR

The information contained herein is furnished without warranty of any kind. Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees. * Hazardous Materials Industrial Standards. Printed on recycled paper.

MISCELLANEOUS INFORMATION

EXAMPLE 2

Material Safety Data Sheet

Version 6.0
Revision Date 02/08/2013
Print Date 11/25/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Methanol
Product Number	:	322415
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption

Target Organs

Eyes, Kidney, Liver, Heart, Central nervous system

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 3)
Acute toxicity, Inhalation (Category 3)
Acute toxicity, Dermal (Category 3)
Specific target organ toxicity - single exposure (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H370	Causes damage to organs.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.

HMIS Classification
Health hazard: 2

Chronic Health Hazard: *
Flammability: 3
Physical hazards: 0

NFPA Rating
Health hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation	Toxic if inhaled. Causes respiratory tract irritation.
Skin	Toxic if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Methyl alcohol

Formula : CH_4O
Molecular Weight : 32.04 g/mol

Component		Concentration
Methanol		
CAS-No.	67-56-1	-
EC-No.	200-659-6	
Index-No.	603-001-00-X	
Registration number	01-2119433307-44-XXXX	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Genotoxicity in vitro - in vitro assay - fibroblast - negative
Mutation in mammalian somatic cells.

Genotoxicity in vivo - mouse - male and female - Intraperitoneal - negative

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Fertility classification not possible from current data.

Teratogenicity

Damage to fetus not classifiable

Specific target organ toxicity - single exposure (Globally Harmonized System)
Causes damage to organs.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
No aspiration toxicity classification

Potential health effects

Inhalation	Toxic if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Toxic if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Methyl alcohol may be fatal or cause blindness if swallowed.
Effects due to ingestion may include:, Headache, Dizziness, Drowsiness, metabolic acidosis, Coma, Seizures.
Symptoms may be delayed., Damage of the:, Liver, Kidney

Synergistic effects
no data available

Additional Information
RTECS: PC1400000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality LC50 - Lepomis macrochirus (Bluegill) - 15,400.0 mg/l - 96 h
	NOEC - Oryzias latipes - 7,900 mg/l - 200 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - > 10,000.00 mg/l - 48 h
Toxicity to algae	Growth inhibition EC50 - Scenedesmus capricornutum (fresh water algae) - 22,000.0 mg/l - 96 h

Persistence and degradability

Vapour pressure	130.3 hPa (97.7 mmHg) at 20.0 °C (68.0 °F) 546.6 hPa (410.0 mmHg) at 50.0 °C (122.0 °F) 169.27 hPa (126.96 mmHg) at 25.0 °C (77.0 °F)
Density	0.791 g/mL at 25 °C (77 °F)
Water solubility	completely miscible
Partition coefficient: n-octanol/water	log Pow: -0.77
Relative vapour density	1.11
Odour	pungent
Odour Threshold	no data available
Evapouration rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Reducing agents, Acids

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LDLO Oral - Human - 143 mg/kg
Remarks: Lungs, Thorax, or Respiration:Dyspnea. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

LD50 Oral - rat - 1,187 - 2,769 mg/kg

Inhalation LC50
LC50 Inhalation - rat - 4 h - 128.2 mg/l

LC50 Inhalation - rat - 6 h - 87.6 mg/l

Dermal LD50
LD50 Dermal - rabbit - 17,100 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - No skin irritation

Serious eye damage/eye irritation
Eyes - rabbit - No eye irritation

Respiratory or skin sensitisation
Maximisation Test - guinea pig - OECD Test Guideline 406 - Does not cause skin sensitisation.

Germ cell mutagenicity

Genotoxicity in vitro - Ames test - S. typhimurium - with and without metabolic activation - negative

Biodegradability	aerobic Result: 72 % - rapidly biodegradable

Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 72 d at 20 °C Bioconcentration factor (BCF): 1.0

Mobility in soil
Will not adsorb on soil.

PBT and vPvB assessment

Results of PBT assessment	This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)., This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Other adverse effects

Biochemical Oxygen Demand (BOD)	600 - 1,120 mg/g
Chemical Oxygen Demand (COD)	1,420 mg/g
Additional ecological information	Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1230 Class: 3 Packing group: II
Proper shipping name: Methanol
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHANOL
Marine pollutant: No

IATA
UN number: 1230 Class: 3 (6.1) Packing group: II
Proper shipping name: Methanol

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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